

WHAT IS CLAIMED IS:

1. A wide area object tracking system comprising:
at least one primary base station and a pair of secondary
5 base stations; each of said pair of secondary base stations being so
coupled to said primary base station so as to define a tag detecting cell;
each of said primary and two secondary base stations being configured to
receive a tag signal broadcast from a tag attached to an object to be
tracked, yielding three received signals indicative of the location of said
10 tag within said cell;
whereby a plurality of overlapping said tag detecting cell in a given space
would allow tracking objects at any place within said given space.
2. A system as recited in claim 1, comprising a plurality of
15 primary base stations.
3. A system as recited in claim 2, wherein each of said
plurality of primary base stations including an inter-primary base station
communication system allowing communication between any one of said
20 plurality of primary base stations.
4. A system as recited in claim 3, further comprising a
central server to which at least one of said plurality of primary base
stations is coupled; said inter-primary base station communication system
25 allowing to relay a communication from any one of said plurality of primary
base stations to said central server.

5. A system as recited in claim 4, wherein a first part of said plurality of said primary base stations is located in a first premises and a second part of said plurality of primary base stations is located in a second premises; said first and second parts of said plurality of primary base stations being respectively coupled to said central server via first and second additional primary base stations.

6. A system as recited in claim 4, further comprising a portable control unit configured to be coupled to at least one of said plurality of primary base stations; said inter-primary base stations communication system allowing to relay a communication between said portable control unit and said central server.

7. A system as recited in claim 1, further comprising a central server coupled to said at least one primary base station.

8. A system as recited in claim 7, wherein said at least one primary base station is configured so as to communicate using three communication channel; a first communication channel being used to communicate with said tag; a second communication channel being used to communicate with said central server; and a third communication channel being used to communicate with at least one of other primary base stations, said pair of secondary base stations, and a portable control unit.

9. A system as recited in claim 8, wherein said first, second, and third communication channels are secured.

10. A system as recited in claim 8, wherein said first, second, and third communication channel being implemented under the IEEE 802.11 protocol.

5 11. A system as recited in claim 7, wherein said central server includes a user-interface to display tag movements in said space.

10 12. A system as recited in claim 7, further comprising at least one tag recording unit for activating said tag and being coupled to said central server.

15 13. A system as recited in claim 12, wherein activating said tag includes generating an identification code and storing said identification code in at least one of i) a memory of said tag recording unit, ii) a memory of said at least one tag, and iii) a memory of said central server.

20 14. A system as recited in claim 13, wherein said tag recording unit is further configured to compare identification codes stored in said memory of said central server with identification codes stored in said memory of said tag recording unit.

25 15. A system as recited in claim 12, wherein said tag recording unit is wirelessly coupled to said central server.

16. A system as recited in claim 12, wherein said tag recording unit includes at least one of a visual display, a tag input port for

communication with said tag, and input means allowing a person to associate information to a tag.

17. A system as recited in claim 7, further comprising a tag
5 tracking terminal coupled to said central server for retrieving from said central server object-related information.

18. A system as recited in claim 17, wherein said tag tracking
terminal is wirelessly coupled to said central server.
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19. A system as recited in claim 17, wherein said tag tracking
terminal includes a display screen or a touch screen.

20. A system as recited in claim 17, wherein said tag tracking
15 terminal includes a telephone.

21. A system as recited in claim 7, further comprising a tag
recovery apparatus coupled to said central server.

22. A system as recited in claim 21, wherein said tag
20 recovery apparatus is wirelessly coupled to said central server.

23. A system as recited in claim 21, wherein said tag
including a rechargeable power source; said tag recovery apparatus being
25 configured so as to recharge power source.

24. A system as recited in claim 21, wherein said tag
recovery apparatus includes an means for inputting a tag unlocking code,

a tag depository compartment for receiving tags, and a guarantee ticket distributor to provide a guarantee ticket in exchange for a tag provided in said tag depository compartment.

5 25. A system as recited in claim 24, wherein said tag recovery apparatus being configured so as to forwards information to said central server about tags received in said tag depository compartment.

10 26. A system as recited in claim 24, wherein said guarantee ticket being selected from the group consisting of cash and discount coupon.

15 27. A system as recited in claim 26, wherein said tag is rented and said guarantee ticket is issued in exchange for said rented tag.

20 28. A system as recited in claim 24, further comprising at least one tag to be attached to an object to be tracked; said at least one tag including a casing and attaching means releasably secured to said casing; said attaching means including a loop having two ends and being
25 secured to said casing at one end and releasably mounted in said casing at its other end; said other end being releasably mounted in said casing via a releasable locking mechanism; said tag recovery apparatus being configured to receive a list of central server tag unlocking codes from said central server for comparison with inputted tag unlocking code both to be
used in assessing if said releasable locking mechanism should be unlocked.

29. A system as recited in claim 24, wherein said tag recovery apparatus includes a display screen and a controller configured so as to display on said display screen a menu offering different form of retribution in exchange for tags.

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30. A system as recited in claim 7, further comprising a tag inventory managing server coupled to said server; said tag inventory managing server being configured for communication with a remote central server.

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31. A system as recited in claim 30, wherein said central server is located in a first airport and said remote central server is located in a second airport;

whereby said tag inventory managing server allows to securely
15 interconnect said central server and said remote central server for communication therebetween.

32. A system as recited in claim 30, wherein said tag inventory managing apparatus is remotely connected to said central server
20 via a network.

33. A system as recited in claim 32, wherein said network is selected from the group consisting of a dedicated network, and the Internet.

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34. A system as recited in claim 7, wherein said central server is coupled to a memory device for storing said object-oriented information.

35. A system as recited in claim 34, further comprising a back-up server coupled to said central server, to said memory device, and to said at least one primary base server for mirroring and monitoring said
5 central server; said back-up server being configured to detect a fault of said central server and to continue the operation of said central server whenever said fault is detected.

36. A system as recited in claim 1, wherein said primary base
10 station includes at least one of a controller, a memory, a receiver, and a transceiver.

37. A system as recited in claim 1, wherein said pair of secondary base station being is wirelessly coupled to said at least one
15 primary base station.

38. A system as recited in claim 1, further comprising:
at least one of said tag to be attached to an object to be tracked; said at least one tag including a power source, and a memory to
20 be programmed with object-related information pertaining to said object to be tracked, and being configured so as to generate and transmit via a transmitter said tag signal indicative of said object-related information.

39. A system as recited in claim 38, wherein said object-
25 related information is selected form the group consisting of a code identifying a boarding airport, a code identifying a transit airport, a code identifying a destination airport, and information about the owner of said object.

40. A system as recited in claim 38, wherein said at least one tag includes a casing and attaching means releasably secured to said casing.

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41. A system as recited in claim 40, wherein said attaching means includes a loop having two ends and being secured to said casing at one end and releasably mounted in said casing at its other end.

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42. A system as recited in claim 41, wherein said other end is releasably mounted in said casing via a releasable locking mechanism.

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43. A system as recited in claim 42, wherein said at least one tag being configured to transmit a request signal after said other end is locked in said locking mechanism.

44. A system as recited in claim 38, wherein said at least one tag is configured to emit a visual signal.

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45. A system as recited in claim 38, wherein said at least one tag further includes a receiver.

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46. A system as recited in claim 38, wherein said memory is further to be programmed with tag-related information; said at least one tag being further configured so as to generate and transmit via said transmitter said tag signal indicative of said object-related information and said tag-related information.

47. A system as recited in claim 46, wherein said tag-related information includes at least one of the power level of said tag signal, and the battery level of said tag.

5 48. A system as recited in claim 1, further comprising at least one portable control unit wirelessly coupled to said system and being configured to receive at least one of said tag signal and object-related information.

10 49. A system as recited in claim 48, wherein said portable control unit being configured to trigger a sleep mode on said tag.

50. A system as recited in claim 49, wherein said portable control unit being configured to re-activate a tag in a sleep mode.

15 51. A system as recited in claim 48, further comprising a central server, wherein said portable control unit being configured to be coupled to said central server.

20 52. A system as recited in claim 51, wherein said at least one tag includes a plurality of tags; said portable control unit allowing to request selected tags from said plurality of tags to broadcast their respective tag signals to be received by said portable control unit.

25 53. A system as recited in claim 52, wherein said portable control unit includes pre-stored object-related information; said portable control unit being configured for comparing said pre-stored object-related

information to said object-related information to create a list of missing tags.

54. A system as recited in claim 53, wherein said pre-stored
5 object-related information being received from said central server.

55. A system as recited in claim 53, wherein said portable
control unit being configured to send said list of missing tags to said
central server; said central server being configured to initiate a tag
10 retrieving procedure when said list of missing tags is not empty.

56. A system as recited in claim 51, wherein said object-
related information includes information concerning a plane to be boarded
by said at least one tag or a plane from which said at least one tag is
15 unloaded; said selected tag being selected on the basis of said
information concerning said plane to be boarded by said at least one tag
or said plane from which said at least one tag is unloaded.

57. A system as recited in claim 1, wherein said object is
20 selected from the group consisting of baggage, goods, people, and
animal.

58. The use of a system as recited in claim 1 in an inventory
managing system.

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59. A wide area object tracking system comprising:
at least one tag; each of said at least one tag being to be
attached to an object to be tracked; said at least one tag including a

memory to receive object-related information pertaining to said object to be tracked or tag-related information and being configured so as to generate and transmit a tag signal indicative of at least one of said object-related information and said tag-related information;

5 a central server including a memory for storing said object-related information;

 a tag recording unit coupled to said central server and being configured to program said memory of said at least one tag with said object-related information;

10 at least one primary base station coupled to said central server; said at least one primary base station being coupled to a pair of secondary base stations so as to define a tag detecting cell; each of said primary and two secondary base stations being configured to receive said tag signal, yielding three received signals to be processed by said primary
15 base station yielding the location of said tag within said cell; said primary base station being configured to forward said location of said tag within said detecting cell to said central server; and

 at least one portable control unit wirelessly coupled to at least one of said central server and said at least one primary base station;
20 said at least one portable control unit being configured to receive at least one of said tag signal, said object-related information and said location of said tag within said detecting cell.

60. A wide area object tracking method comprising:

25 activating at least one tag to be attached to an object to be tracked causing said at least one tag to broadcasting a tag signal indicative of information pertaining to at least one said object to be tracked and said at least one tag;

providing at least one primary base station and a pair of secondary base stations; said pair of secondary base stations being so coupled so as to define a tag detecting cell with said primary base stations;

5 each of said at least one primary base station and said pair of secondary base stations coupled thereof listening for tag signals within said tag detecting cell; and

 upon detection of one of said tag signals by said at least one primary base stations and said pair of secondary base stations coupled
10 thereof, yielding three respective received signals, using said three respective received signals to determine the location of said at least one tag within said tag detecting cell.

61. A method as recited in claim 60, wherein said at least
15 one tag putting itself in a listening mode for a first period of time following said tag broadcasting a tag signal and before putting itself in a sleep mode for a second period of time.

62. A method as recited in claim 60, wherein each of said at
20 least one primary base station and said pair of secondary base stations coupled thereof listening for tag signals within said tag detecting cell following said at least one of said at least one primary base station and each of said pair of secondary base stations sending query signal to said at least one tag within said detecting cell.

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63. A method as recited in claim 62, further comprising each of said at least one tag responding sequentially to said query signals.

64. A method as recited in claim 60, wherein each of said pair of secondary base stations communicating their respective received signal to said at least one primary base station coupled thereto; said at least one primary base station determining the location of said at least one tag within said tag detecting cell.

65. A method as recited in claim 60, further comprising transmitting to a central server coupled to said at least one primary base station said location of said at least one tag.

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66. A method as recited in claim 65, wherein said central server using said location of said at least one tag to perform tag grouping.

67. A method as recited in claim 60, wherein said activating at least one tag includes communicating to a central server a list of activated tags.

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68. A method as recited in claim 67, wherein said at least one primary base station communicating with said central server to obtain said list of activated tags.

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69. A method as recited in claim 68, wherein said at least one primary base station transmitting said list of activated tags to each secondary base station of said pair of secondary base stations.

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70. A method as recited in claim 68, wherein said activating at least one tag includes transmitting to said at least one primary base

station a list of checkpoints including a sequence of positions along an expected itinerary of said at least one tag.

71. A method as recited in claim 70, wherein said at least
5 one tag verifying the concordance of said checkpoints along its actual itinerary and sending an alarm if any difference is detected between said checkpoints and predetermined positions along said itinerary.

72. A method as recited in claim 70, wherein said at least
10 one primary base station communicating a lost of said at least one tag to said central server when a tag signal broadcasted by said at least one tag is not received at a predetermined time by said at least one primary base station or by one of said pair of secondary base station while said list of checkpoints includes a position in the detecting cell including said primary
15 base station corresponding to said predetermined time.

73. A method as recited in claim 72, further comprising at least one of said at least one primary base stations and each of said pair of secondary base station requesting an emergency identification of said
20 at least one tag following said communicating a lost of said at least one tag.

74. A method as recited in claim 72, further comprising said primary base station estimating a probable position of said at least one tag
25 following said communicating the lost of said at least one tag.

75. A method as recited in claim 72, further comprising said primary base station transmitting at least one query signal to communicate

with said at least one tag following said communicating the lost of said at least one tag.

76. A method as recited in claim 60, wherein listening for tag
5 signals within said tag detecting cell includes said primary base station querying tags within said detecting cell.

77. A method as recited in claim 76, wherein said primary
base station querying tags within said detecting cell following receiving a
10 request from a central server to which said primary base station is coupled.

78. A method as recited in claim 60, wherein said activating
at least one tag includes said at least one tag receiving an identification
15 code.

79. A method as recited in claim 60, wherein said activating
at least one tag includes transmitting to a central server coupled to said at
least one primary base station at least one of said information pertaining
20 to said object to be tracked and said identification code.

80. A method as recited in claim 60, wherein said activating
at least one tag includes first receiving said information pertaining to said
object to be tracked.

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81. A method as recited in claim 60, wherein said tag signal
indicative of information pertaining to said object to be tracked being
broadcast at predetermined interval.

82. A method as recited in claim 60, wherein said activating at least one tag includes verifying the integrity of signal transmission from said at least one tag.

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83. A method as recited in claim 60, wherein using said three received signals to determine the location of said at least one tag within said tag detecting cell is achieved using at least one of Time Difference Of Arrival (TDOA), Received Signal Strength (RSS) and Artificial Neural
10 Network (ANN) techniques.

84. A method as recited in claim 60, wherein said at least one tag comprising a plurality of tags; the method further comprising logically grouping said plurality of tags according to one of said object-
15 related information and said tag-related information, yielding at least one tag bundle.

85. A method as recited in claim 84, wherein said logically grouping is performed dynamically.

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86. A method as recited in claim 84, further comprising monitoring said at least one tag bundle.

87. A wide area intelligent object tracking system comprising:
25 a plurality of tags, each to be attached to a different object to be tracked; each of said plurality of tags including a memory to receive object-related information pertaining to said different object to be tracked

and being configured so as to generate and transmit a tag signal indicative of said object-related information;

5 a plurality of primary base stations, each coupled to a pair of secondary base stations so as to define a tag detecting cell; said plurality of primary base stations defining overlapping cells; each of said primary and two secondary base stations being configured to receive said tag signals, yielding three received signals to be processed by said primary base station yielding the location of said tag within said cell; and

10 a central server coupled to said plurality of primary base stations for receiving at least one of said tag signals and said location of said tag within said cell and including an expert agent for tracking said plurality of tags within said overlapping cells.